rust-vmm

Building the Virtualization Stack of the Future

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Who am I?

- Open Source Enthusiast
- Software Development Engineer @ Amazon
- Firecracker maintainer
- rust-vmm contributor

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VMM or Hypervisor?

Linux Virtualization Stack
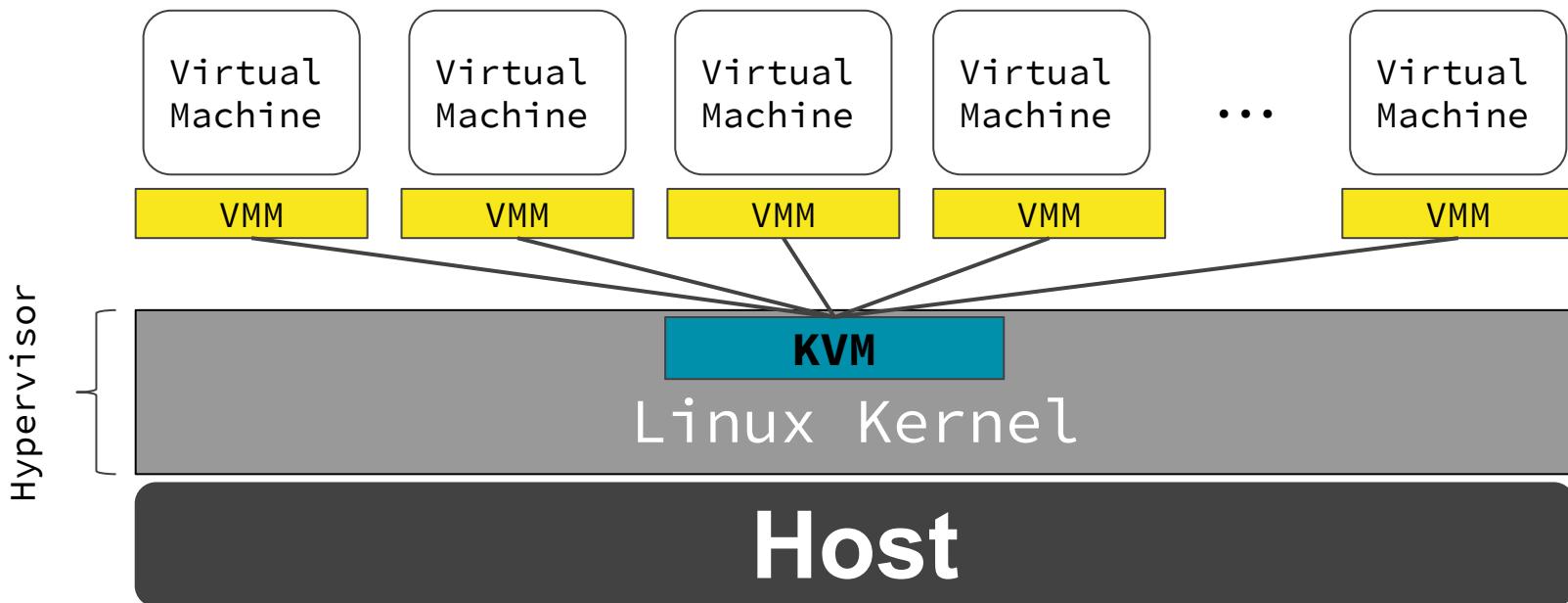
What is rust-vmm?

———
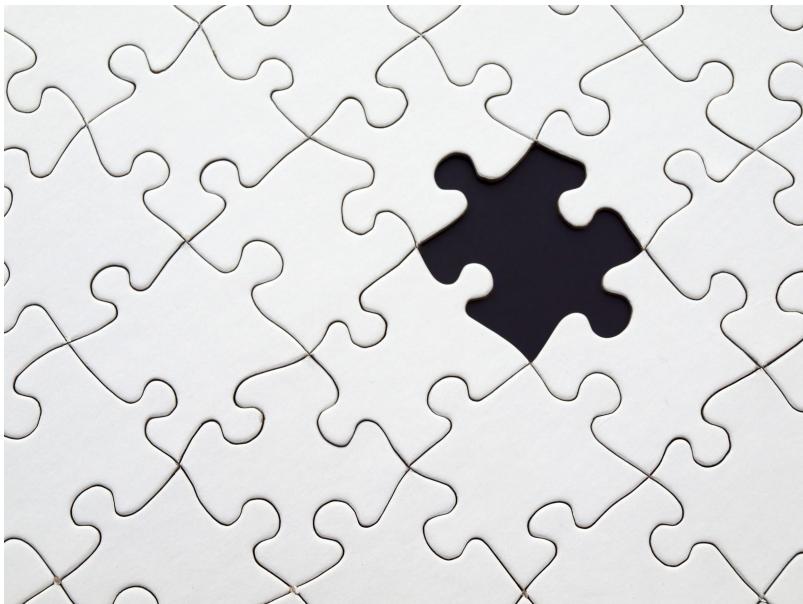
- Building blocks for VMMs written in Rust
- Virtualization components (crates)
- Open Source

Why rust-vmm?

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- Faster development for new custom VMMs
- Security & Testability
- Clean interface
- Reduce code duplication (CrosVM & Firecracker)

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rust-vmm development

Who is contributing?

Alibaba Cloud

AWS

Cloudbase Solutions

CrowdStrike

Google

Intel

RedHat

Individual Contributors

Adding crates to rust-vmm

- CrosVM/Firecracker
  - Wrappers over the KVM API
  - Guest Memory
  - ...
- Developing from scratch
  - vhost-user
  - ACPI
  - ...

# Existing crates

vm-memory - Firecracker

— — —

- Guest Address

vm-memory - Firecracker

- Guest Address
- Memory Region

```
Start addr              End addr
(GuestAddress)          (GuestAddress)
        │       Anonymous        │
        │      Shared Mem        │
        ▼                        ▼
   ┌─────────────────────────┐
   │      mem-region         │
   └─────────────────────────┘
```

vm-memory - Firecracker

— — —

- Guest Address
- Memory Region
- Guest Memory

```
Start addr          End addr
(GuestAddress)      (GuestAddress)

              Anonymous
              Shared Mem

        mem-region
```

| mem-region | mem-region | | mem-region | | mem-region |
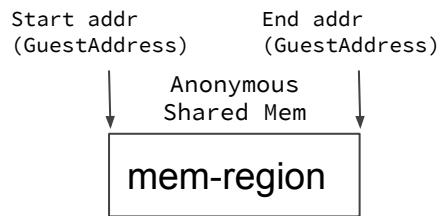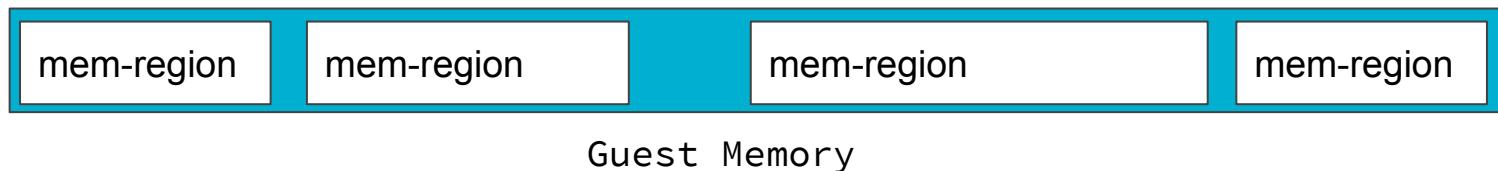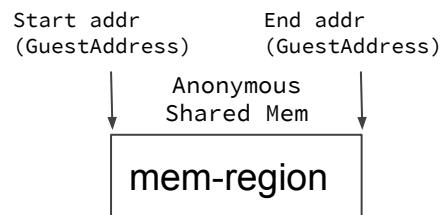
Guest Memory

vm-memory - Firecracker

- Guest Address
- Memory Region
- Guest Memory
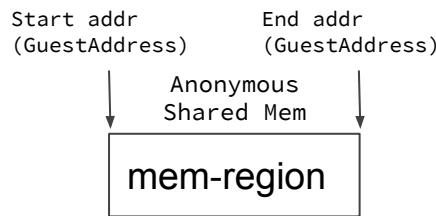
vm-memory - rust-vmm

- **Trait** Guest Address
- **Trait** Memory Region
- **Trait** Guest Memory

Start addr   End addr
(GuestAddress)   (GuestAddress)

        Anonymous
        Shared Mem

```
mem-region
```

Start addr   End addr
(GuestAddress)   (GuestAddress)

        Anonymous/File
        Shared Mem

```
mem-region
```

```
mem-region    mem-region        mem-region            mem-region
```
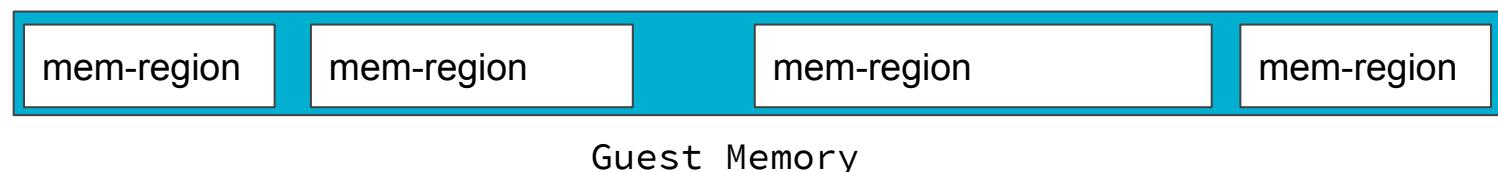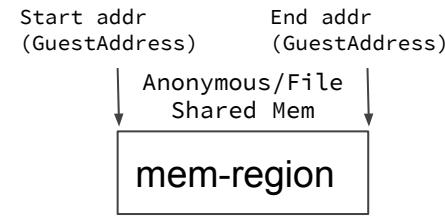
Guest Memory

New Usecases Supported with rust-vmm

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- Vhost-user
  - memfd based Guest Memory
- memory hotplug
 - cross region reads from Guest Memory

kvm-ioctls

- Line Coverage (79.3% -> 91.3%)
- Documentation for public interface
- Code Examples
- Experimental aarch64 support

From idea to published crate

Current Status

— — —

vmm-vcpu

linux-loader

vm-virtio

vhost

vm-device

Milestone 0

Empty
Crate

vm-memory

Milestone 1

Crate
in Dev

kvm-bindings

kvm-ioctls

Milestone 2

Publish
crates.io
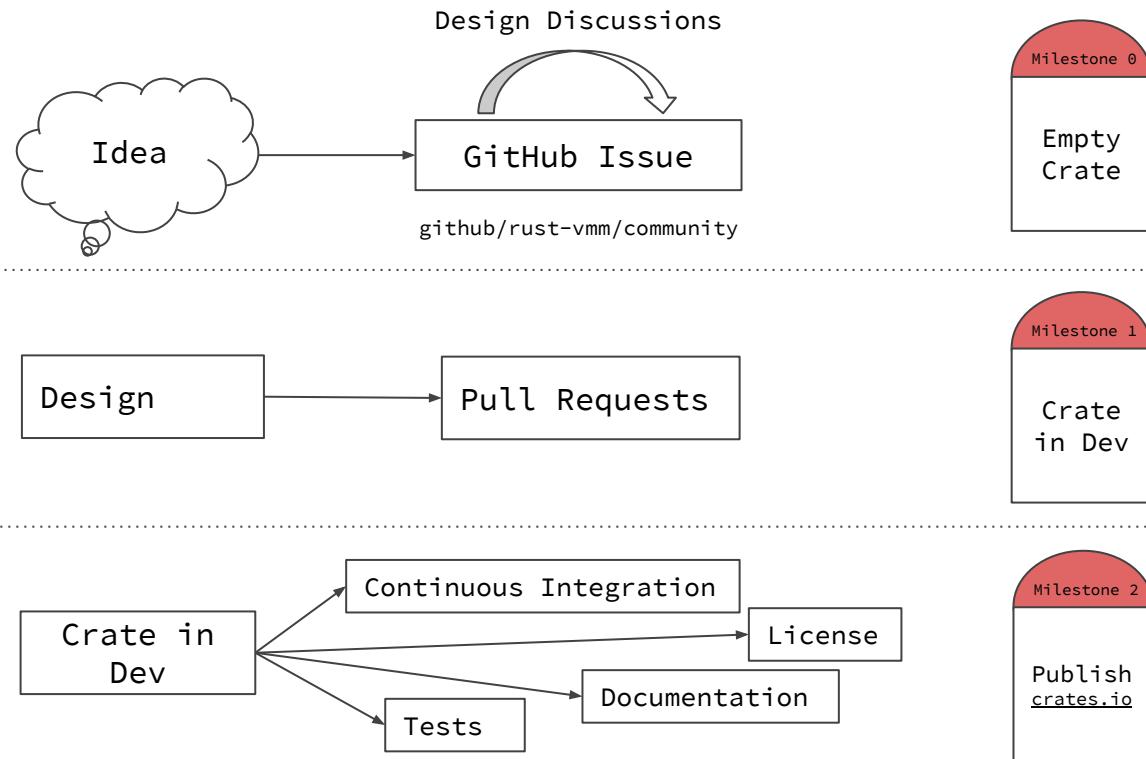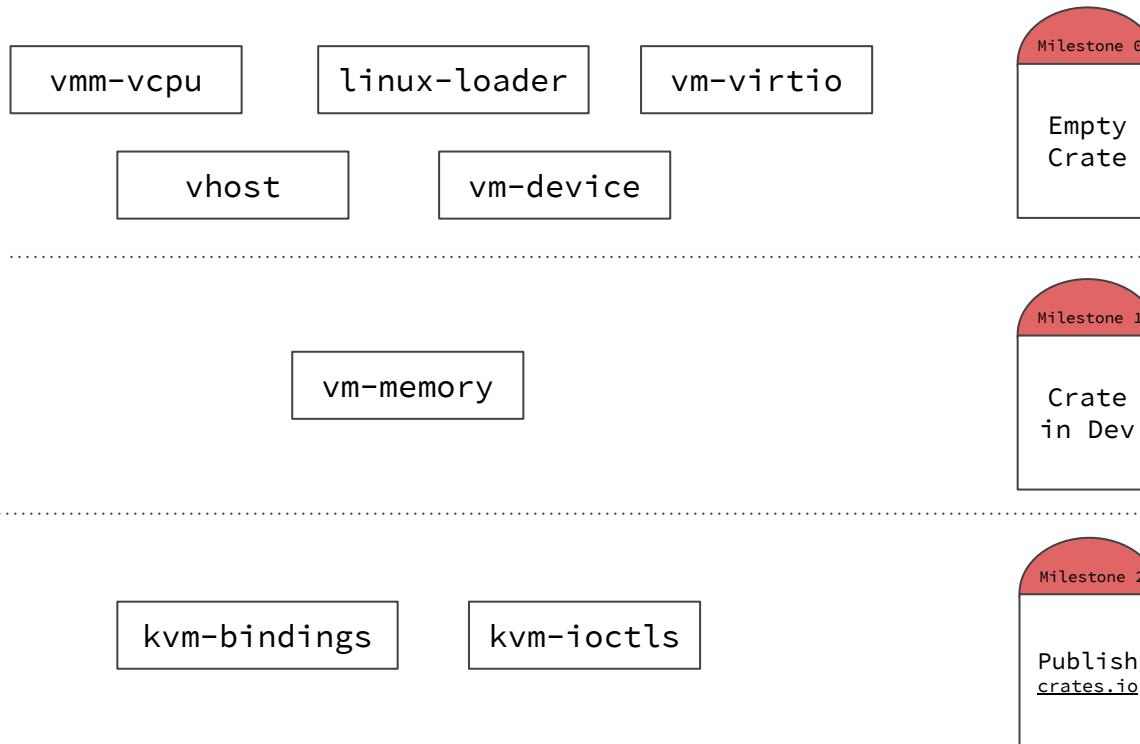
Demo Time

Fake Demo Time

containers-vmm

```
VMM API
```

containers-vmm
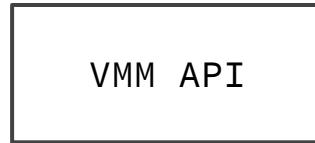
rust-vmm components
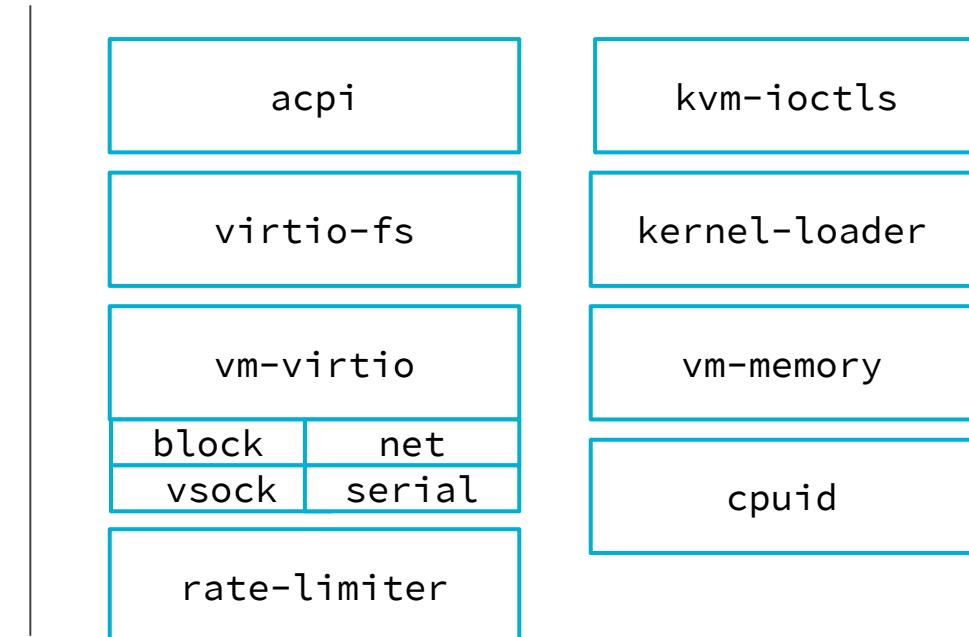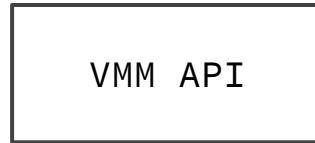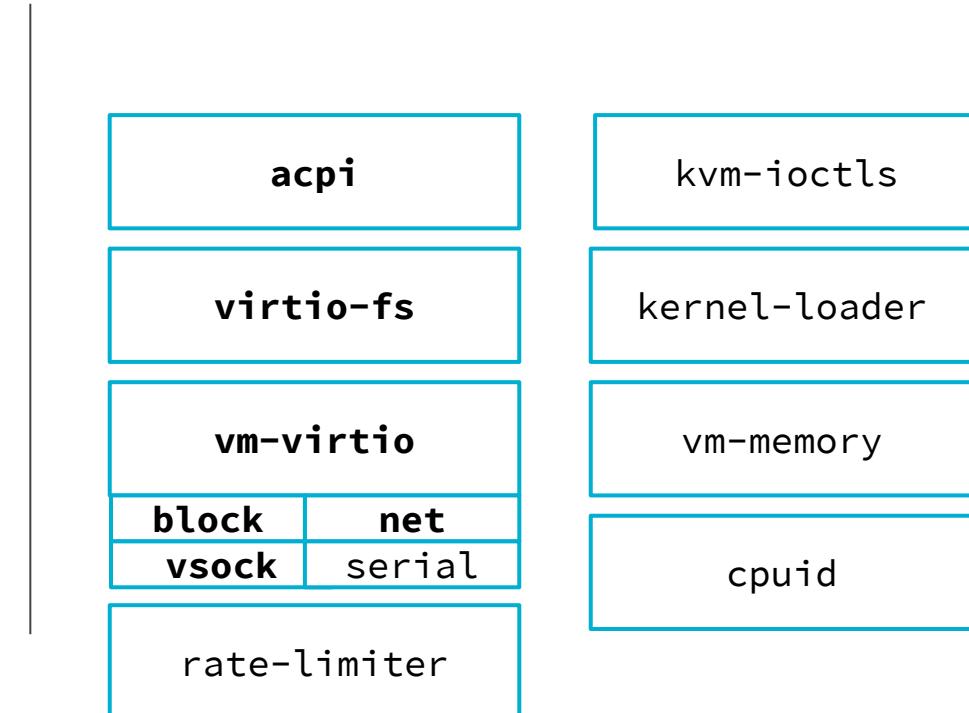
| VMM API |

| acpi |

| virtio-fs |

| vm-virtio |
| block | net |
| vsock | serial |

| rate-limiter |

| kvm-ioctls |

| kernel-loader |

| vm-memory |

| cpuid |

containers-vmm

rust-vmm components

VMM API

acpi	kvm-ioctls

virtio-fs	kernel-loader

vm-virtio		vm-memory
block	**net**	
vsock	serial	cpuid

rate-limiter

containers-vmm

rust-vmm components

VMM API

acpi	kvm-ioctls

virtio-fs	kernel-loader

vm-virtio	vm-memory

block	net
vsock	serial

cpuid

rate-limiter

containers-vmm

rust-vmm components

```
VMM Glue
```

```
VMM API
```

```
acpi
```

```
virtio-fs
```

```
vm-virtio
```

```
block    net
vsock    serial
```

```
rate-limiter
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kvm-ioctls
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kernel-loader
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```
vm-memory
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```
cpuid
```
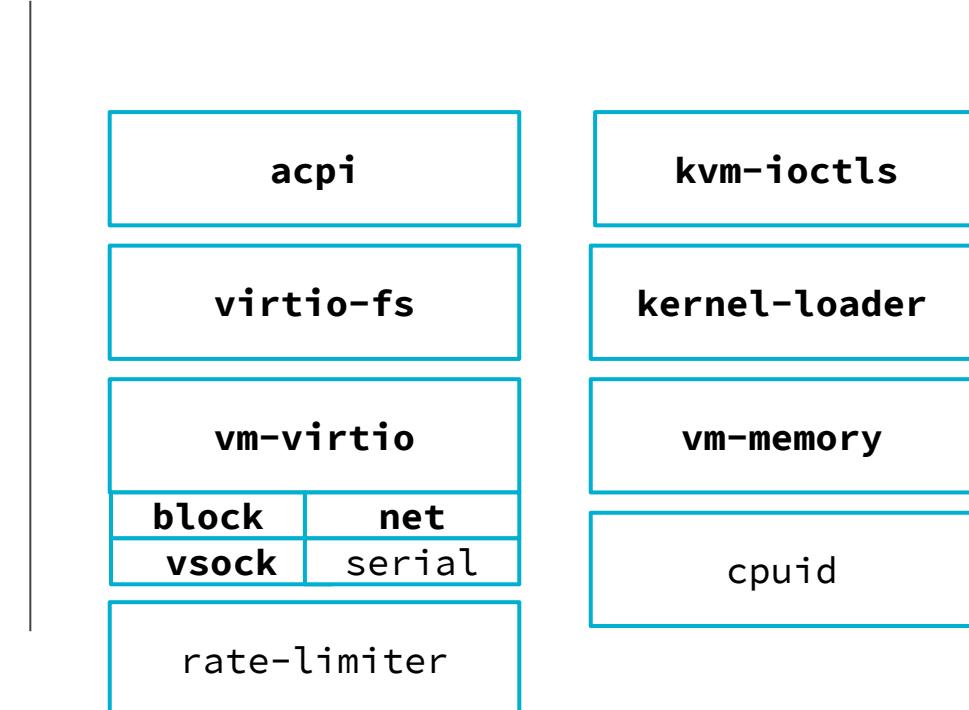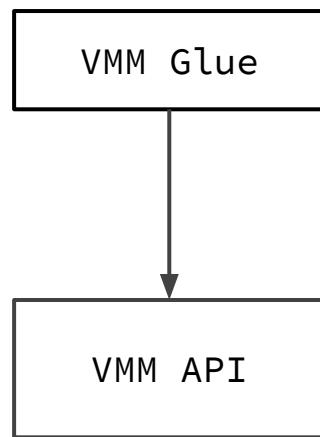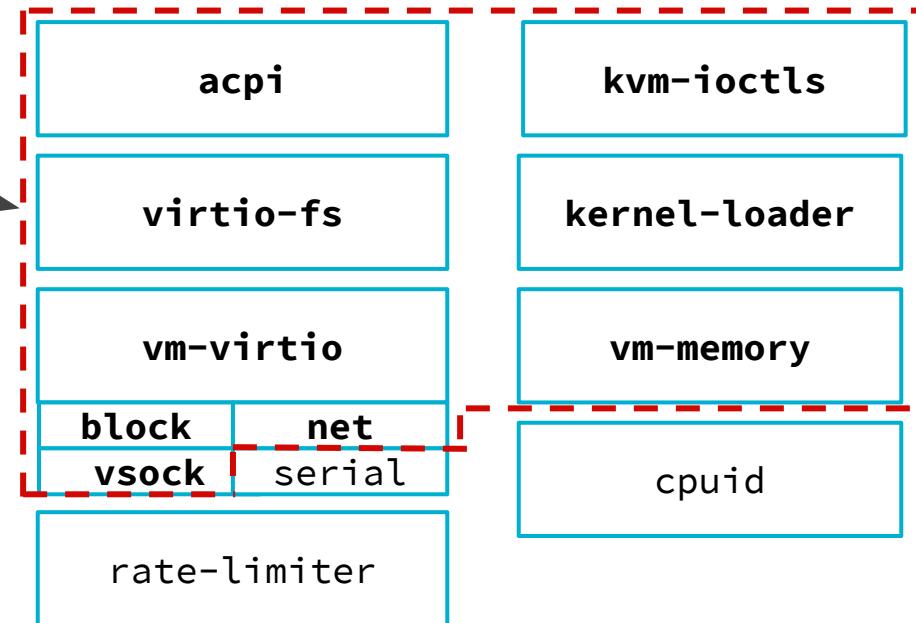
Does the world need more VMMs?

rust-vmm powering:

Now:

- Firecracker

Future:

- CrosVM
- QEMU
-

Open Questions

- Test integration of crates
    - Create a reference VMM implementation
    - Same version for all crates?

- Security Testing
    - Fuzzing

What's next?

- Hypervisor-agnostic crates
- Using rust-vmm crates in existing VMMs
- Purpose-built VMM for container workloads

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Come decide with us!

Be part of rust-vmm!

- Become a [member of rust-vmm](#) on GitHub
- Subscribe to the [rust-vmm](#) email list
- Want feedback on your work? Submit a [review request](#)!